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1. Scope:

This procedure describes the method for measuring the electrical resistance of a stainless steel warm up heater brazed joint. This is done by measuring the voltage drop across the joint with a 10.0 amp DC current applied through the heater tubing. This test is used for a stainless/stainless steel joint or a stainless/brass joint.

2. Applicable Documents:

RHIC-MAG-Q-1000 - Magnet Division Procedure for Control of
Measurement and Test Equipment

RHIC-MAG-Q-1004 - Discrepancy Reporting Procedure

Operating/instruction manuals for the test equipment as required

3. Requirements:

3.1 Equipment Required:

- 3.1.1 Digital micro-ohmmeter with 10 amp current capability.
Valhalla model 4300B or equivalent.
Alternate equipment: 10 Amp DC constant current power supply and a digital
voltmeter with 10 μ V resolution on the 200 mV range.

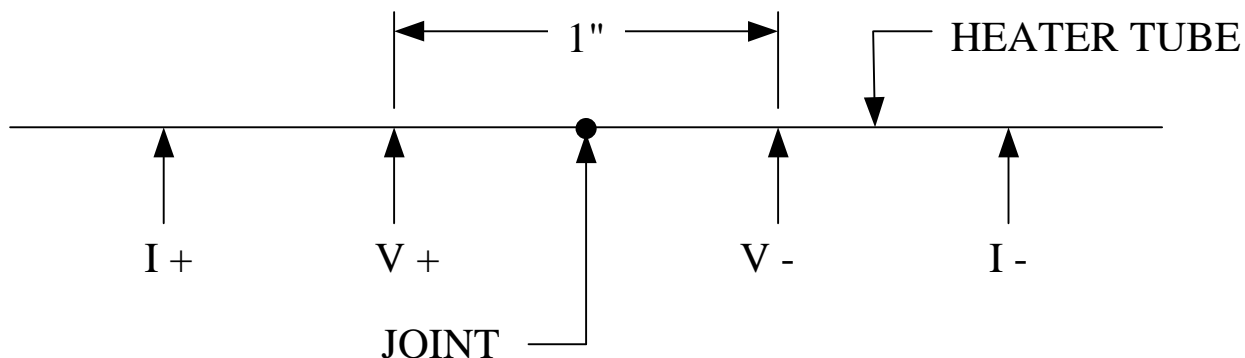
3.2 Safety Precautions:

- 3.2.1 The technicians shall be qualified by their cognizant technical supervisor in the operation of the required test equipment and these electrical testing procedures. They shall be familiar with the latest revision of the applicable documents referenced in section 2. In addition, some of these tests require the technician to have special training. A list of qualified personnel shall be maintained with the RHIC ES&H Coordinator and the RHIC Training Coordinator.
- 3.2.2 Some of these electrical test procedures have specific safety requirements. The technicians performing these specific tests shall rigorously follow all the safety requirements listed as well as those prescribed by the BNL ES&H Standard.

3.3 Procedure: 4-Wire Resistance Method.

3.3.1 The joint to be tested should be at room temperature (approximately) and free (cleaned) of any residual flux from the brazing operation. Inspect the joint for any cracks, lumps, sharp edges, or unusual coloring. The joint should be smooth and uniform.

3.3.2 Connect the ohmmeter voltage sense leads (V+ & V-) to be centered across the brazed joint such that the distance between the sense points is one inch (inner edge to inner edge) using 22 gauge (typical) wire. Connect the ohmmeter current source leads (I+ & I-) at a point approximately one inch beyond the voltage sense connection leads on tubing using 14 gauge (minimum) wire. The V+ sense lead gets paired with the I+ current lead. The V- lead gets paired with the I- lead respectively. These four connections can be made with a test fixture using modified 3AG size fuse clips.



3.3.3 Set the ohmmeter test current to 10 Amps and the voltage range to 200 mVolts. This corresponds to the 20 milliohm range. Turn on the test current and read the resistance on the display. Verify that the resistance is within the tolerance range for the type of joint being tested. If the joint is not within tolerance, notify your supervisor and follow the discrepancy reporting procedure. This test is a go/no-go requirement and no data is recorded except if the joint has to be repaired/reworked to be within tolerance.

Joint Resistance and Tolerance

stainless/stainless:	typical	2.79 mΩ,	Hi Limit = 4.0 mΩ Low Limit = 1.5 mΩ
stainless/brass:	typical	2.05 mΩ,	Hi Limit = 3.5 mΩ Low Limit = 0.25 mΩ

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3.3.4 Turn off the test current and disconnect the test connections.

4. Quality Assurance Provisions:

- 4.1 The quality assurance provisions of this procedure requires that the technician shall be responsible for performing all inspections and tests in compliance with the procedural instructions contained herein and the recording of test results on the data sheet(s) and/or on the production traveler.
- 4.2 The technician is responsible for verifying that the test and measurement equipment used in this procedure has been calibrated and that the calibration sticker (date) has not expired as per RHIC-MAG-Q-1000.
- 4.3 The technician is responsible for notifying the technical supervisor and/or the cognizant engineer of any discrepancies occurring during the performance of this procedure. All discrepancies shall be identified and reported as per RHIC-MAG-Q-1004.

5. Preparation for Delivery:

N/A